

Amendments to the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (original) A method for improving focus accuracy in a lithography system including an exposing area for exposing images onto top surfaces of substrates, comprising the steps of:

- a. determining a proper focus distance for a specific region on a top surface of a substrate, the proper focus distance determined using a calibration sensor when the specific region is not positioned under the exposing area;
- b. producing a first measurement relating to the specific region at the proper focus distance, the first measurement produced using a secondary control sensor when the specific region is not positioned under the exposing area;
- c. producing a second measurement relating to the specific region, the second measurement produced using a primary control sensor while the specific region is positioned under the exposing area; and
- d. adjusting an actual focus distance based on the first and second measurements while the specific region is positioned under the exposing area, wherein the calibration sensor has a higher focus accuracy than each of the secondary control sensor and the primary control sensor.

2. (original) The method of claim 1, further comprising the following step:

- e. exposing at least a portion of the image on the specific region using exposing area.

3. (original) The method of claim 1, wherein:

the first measurement corresponds to an output that the secondary control sensor should produce when the secondary control sensor is at the proper focus distance relative to the specific region, and

the second measurement corresponds to an output of the primary control sensor while the specific region is positioned under the exposing area.

4. (original) The method of claim 3, wherein step (d) comprises adjusting the actual focus distance by adjusting the position of the specific region until the primary control sensor produces the first measurement while the specific region is positioned under the exposing area.

5. (original) The method of claim 3, wherein step (d) comprises the steps of:

(i) determining a difference between the second measurement and the first measurement; and

(ii) adjusting the position of the specific region based on the difference.

6. (original) The method of claim 1, wherein:

the first measurement relates to a distance D1 between the secondary control sensor and the specific region, prior to positioning the specific region under the exposing area, and

the second measurement relates to a distance D2 between the primary control sensor and the specific region, while the specific region is positioned under the exposing area.

7. (original) The method of claim 6, wherein step (d) comprises the step of adjusting the focus distance by adjusting distance D2 to equal distance D1, thereby positioning the specific region at the proper focus distance with respect to the exposing area.

8. (original) The method of claim 1, wherein the calibration sensor comprise at least one air gauge.

9. (original) The method of claim 8, wherein the secondary control sensor comprises at least one capacitance gauge, and wherein the primary control sensor is substantially identical to the secondary control sensor.

10. (original) The method of claim 1, wherein the calibration sensor comprises at least one optical gauge.

11. (cancelled)

12. (original) The method of claim 1, wherein the exposing area comprises a lens.

13. (original) The method of claim 1, wherein the exposing area projects an electron beam.

14. (original) The method of claim 1, wherein the exposing area projects a shadow.
15. (cancelled)
16. (cancelled)
17. (cancelled)
18. (cancelled)
19. (original) The method of claim 1, wherein steps (a) and (b) are performed at a location remote from the exposing area.
20. (original) The method of claim 1, wherein the secondary control sensor and the primary control sensor are distinct sensors that are substantially identical to one another.
21. (original) A method for improving focus accuracy in a lithography system including an exposing area for exposing an image onto a top surface of a substrate according to an exposure pattern, comprising the steps of:
 - a. moving the substrate in a manner that simulates the exposure pattern;
 - b. determining proper focus distances using a first type of sensor as the substrate is moved in a manner that simulates the exposure pattern, wherein each proper

focus distance corresponds to a region on the top surface of the substrate prior to the region being positioned under the exposing area;

c. producing a set of measurements using a second type of sensor as the substrate is moved in the manner that simulates the exposure pattern, wherein each measurement in the set of measurements corresponds to a region on the top surface of the substrate when the specific region is at the proper focus distance as determined using the first type of sensor;

d. moving the substrate according to the exposure pattern such that a specific region on the top surface of the substrate is located under the exposing area;

e. producing a specific measurement relating to the specific region under the exposing area, the specific measurement produced using the second type of sensor; and

f. adjusting a focus distance based on the specific measurement and a corresponding measurement in the set of measurements,

wherein the first type of sensor has a higher focus accuracy than the second type of sensor.

22. (original) The method of claim 21, further comprising the step of:

g. exposing at least a portion of the image on the specific region using exposing area.

23. (original) The method of claim 12, further comprising the steps of:

h. moving the substrate according to the exposure pattern such that another specific region on the top surface is located under the exposing area;

i. repeating steps (e), (f), (g) and (h) a plurality of times.

24. (original) The method of claim 21, wherein step (f) comprises adjusting the focus distance by adjusting the position of the specific region until the second type of sensor produces the corresponding measurement in the set of measurements while the specific region is positioned under the exposing area.

25. (original) The method of claim 21, wherein step (f) comprises the steps of:

- (i) determining a difference between the specific measurement relating to the specific region and the corresponding measurement in the set of measurements; and
- (ii) adjusting the position of the specific region based on the difference.

26. (original) The method of claim 21, wherein the first type of sensor comprises at least one air gauge.

27. (original) The method of claim 26, wherein the second type of sensor comprises at least one capacitance gauge.

28. (original) The method of claim 21, wherein steps (a), (b) and (c) are performed at a location remote from the exposing area.

29. (cancelled)

30. (original) The method of claim 21, wherein the exposing area comprises a lens.

31. (previously presented) A focus system for use in a lithography system including an exposing area for exposing an image onto a substrate according to an exposure pattern, the focus system comprising:

a calibration sensor to determine a proper focus distance relating to a specific region on a top surface of the substrate prior to positioning the specific region under the exposing area;

a secondary control sensor to produce a first measurement relating to the specific region at the proper focus distance, wherein the secondary control sensor produces the first measurement prior to the specific region being positioned under the exposing area;

a primary control sensor to produce a second measurement relating to the specific region while the specific region is positioned under the exposing area; and

a focus adjustor to adjust an actual focus distance based on the first and second measurements while the specific region is positioned under the exposing area,

wherein the calibration sensor has a higher focus accuracy than each of the secondary control sensor and the primary control sensor.

32. (original) The system of claim 31, wherein:

the first measurement corresponds to an output that the secondary control sensor should produce when the secondary control sensor is at the proper focus distance relative to the specific region, and

the second measurement corresponds to an output of the primary control sensor while the specific region is positioned under the exposing area.

33. (original) The system of claim 32, wherein the focus adjustor adjusts a position of the specific region until the primary control sensor produces the first measurement while the specific region is positioned under the exposing area.

34. (original) The system of claim 32, wherein the adjustor adjusts a position of the specific region based on a difference between the second measurement and the first measurement.

35. (original) The system of claim 31, wherein:

the first measurement relates to a distance D1 between the secondary control sensor and the specific region prior to positioning the specific region under the exposing area, and

the second measurement relates to a distance D2 between the primary control sensor and the specific region while the specific region is positioned under the exposing area.

36. (original) The system of claim 35, wherein the adjustor adjusts the focus distance by adjusting distance D2 to equal distance D1, thereby positioning the specific region at the proper focus distance with respect to the exposing area.

37. (original) The system of claim 31, wherein the calibration sensor comprises at least one air gauge.

38. (original) The system of claim 37, wherein the secondary control sensor comprises at least one capacitance gauge, and wherein the primary control sensor is substantially identical to the secondary control sensor.
39. (original) The system of claim 31, wherein the calibration sensor and the secondary control sensor are located remote from the exposing area, and wherein the primary control sensor is located in close proximity to the exposing area.
40. (original) The system of claim 31, wherein the calibration sensor comprises at least one optical gauge.
41. (cancelled)
42. (original) The system of claim 31, wherein the exposing area comprises a lens.
43. (original) The system of claim 31, wherein the exposing area projects an electron beam.
44. (original) The system of claim 31, wherein the exposing area projects a shadow.
45. (original) The system of claim 31, wherein the specific region referred to with relation to the calibration sensor, the secondary control sensor, the primary control sensor, and the focus adjustor is located on the same substrate.

46. (cancelled)

47. (cancelled)

48. (cancelled)

49. (original) The system of claim 31, wherein the calibration sensor and the secondary control sensor are at a location remote from the exposing area.

50. (original) The system of claim 31, wherein the secondary control sensor and the primary control sensor are distinct sensors that are substantially identical to one another.

51. (original) A focus system for use in a lithography system including an exposing area for exposing an image onto a substrate according to an exposure pattern, the focus system comprising:

a calibration sensor to determine proper focus distances as the substrate is moved in a manner that simulates the exposure pattern prior to the substrate being positioned under the exposing area, wherein each proper focus distance corresponds to a region on the top surface of the substrate;

a secondary control sensor to produce a set of measurements as the substrate is moved in the manner that simulates the exposure pattern prior to the substrate being positioned under the exposing area, wherein each measurement in the set of measurements corresponds to a region on the top surface of the substrate when the specific region is at the proper focus distance as determined using the calibration sensor;

a primary control sensor to produce a specific measurement relating to a specific region on the surface of the substrate that is positioned under the exposing area; and

an adjustor to adjust a focus distance based on the specific measurement and a corresponding measurement in the set of measurements,

wherein the calibration sensor has a higher focus accuracy than each of the secondary control sensor and the primary control sensor.

52. (previously presented) A method for improving focus accuracy in a lithography system including an exposing area for exposing images onto top surfaces of substrates, comprising the steps of:

a. determining a proper focus distance for a specific region on a top surface of a first substrate, the proper focus distance determined using a calibration sensor when the specific region of the first substrate is not positioned under the exposing area;

b. producing a first measurement relating to the specific region of the first substrate at the proper focus distance, the first measurement produced using a secondary control sensor when the specific region of the first substrate is not positioned under the exposing area;

c. producing a second measurement relating to a specific region on a top surface of a second substrate, the second measurement produced using a primary control sensor while the specific region of the second substrate is positioned under the exposing area; and

d. adjusting an actual focus distance based on the first and second measurements while the specific region of the second substrate is positioned under the exposing area,

wherein the calibration sensor has a higher focus accuracy than each of the secondary control sensor and the primary control sensor.

53. (previously presented) The method of claim 52, wherein the first and second substrates are located on a first wafer and a second wafer, respectively.

54. (previously presented) A method for improving focus accuracy in a lithography system including an exposing area for exposing images onto top surfaces of substrates, comprising the steps of:

a. determining a proper focus distance for a first specific region on a top surface of a wafer, the proper focus distance determined using a calibration sensor when the specific region is not positioned under the exposing area;

b. producing a first measurement relating to the first specific region at the proper focus distance, the first measurement produced using a secondary control sensor when the specific region is not positioned under the exposing area;

c. producing a second measurement relating to a second specific region on the top surface of the wafer, the second measurement produced using a primary control sensor while the second specific region is positioned under the exposing area; and

d. adjusting an actual focus distance based on the first and second measurements while the second specific region is positioned under the exposing area,

wherein the calibration sensor has a higher focus accuracy than each of the secondary control sensor and the primary control sensor.

55. (previously presented) A focus system for use in a lithography system including an exposing area for exposing an image onto a substrate according to an exposure pattern, the focus system comprising:

a calibration sensor to determine a proper focus distance relating to a specific region on a top surface of a first substrate prior to positioning the specific region under the exposing area;

a secondary control sensor to produce a first measurement relating to the specific region of the first substrate at the proper focus distance, wherein the secondary control sensor produces the first measurement prior to a specific region on a top surface of a second substrate being positioned under the exposing area;

a primary control sensor to produce a second measurement relating to the specific region on the second substrate while the specific region of the second substrate is positioned under the exposing area; and

a focus adjustor to adjust an actual focus distance based on the first and second measurements while the specific region of the second substrate is positioned under the exposing area,

wherein the calibration sensor has a higher focus accuracy than each of the secondary control sensor and the primary control sensor.

56. (previously presented) The system of claim 55, wherein said first and second substrates are located on a first wafer and a second wafer, respectively.

57. (previously presented) A focus system for use in a lithography system including an exposing area for exposing an image onto a wafer according to an exposure pattern, the focus system comprising:

a calibration sensor to determine a proper focus distance relating to a first specific region on a top surface of the wafer prior to positioning said first specific region under the exposing area;

a secondary control sensor to produce a first measurement relating to said first specific region at said proper focus distance, wherein said secondary control sensor produces said first measurement prior to a second specific region on the top surface of the wafer being positioned under the exposing area;

a primary control sensor to produce a second measurement relating to the second specific region on the top surface of the wafer, while the second specific region is positioned under the exposing area; and

a focus adjustor to adjust an actual focus distance based on the first and second measurements while the second specific region is positioned under the exposing area,

wherein the calibration sensor has a higher focus accuracy than each of the secondary and primary control sensors.

58. (currently amended) A method for improving focus accuracy in a lithography system, the method comprising:

for a specific region of a top surface of a substrate, measuring a focus distance using a calibration sensor to generate a first measurement;

for the specific region, measuring the focus distance using a control sensor to generate a second measurement;

storing calibration information generated using the first and second measurements together with information indicative of the location of the specific region; and

for a subsequent corresponding region, measuring the focus distance using the control sensor and correcting the measurement using the stored calibration information,

wherein the calibration sensor has a higher focus accuracy than the control sensor.

59. (previously presented) A method according to claim 58, wherein the subsequent corresponding region corresponds to the specific region, but is on a subsequent substrate.
60. (previously presented) A method according to claim 58, wherein the specific region is on a first die and the subsequent corresponding region is on a corresponding location on a subsequent die.
61. (previously presented) A method according to claim 58, wherein the calibration sensor comprises an air gauge.